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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/726,801	11/29/2000	Hisao Sato	P5366a	5683

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EPSON RESEARCH AND DEVELOPMENT INC  
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SAN JOSE, CA 95134

EXAMINER

DASTOURI, MEHRDAD

ART UNIT	PAPER NUMBER
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2623

DATE MAILED: 07/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/726,801

Applicant(s)

SATO ET AL.

Examiner

Mehrdad Dastouri

Art Unit

2623

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 14 May 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7, 9-13, 15-20, 26 and 27 is/are rejected.
- 7) ☒ Claim(s) 8, 14 and 21-25 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Response to Amendment*

1. Applicants' amendment filed May 14, 2004, has been entered and made of record.
2. Applicants' arguments regarding Claims 1, 16 and 21, have been fully considered but they are not persuasive. The **distance between two points** (the essential limitation recited in the claims) is a fundamental attribute in pattern recognition. The amended claim limitation reciting, "calculating the square of the distance between said identified two sub-image points without determining the true distances between said identified sub-image points" is an inherent step of calculating a distance. Considering points A ( $x_1, y_1$ ) and B ( $x_2, y_2$ ), inherently, the sum of  $(x_1-x_2)^2$  and  $(y_1-y_2)^2$  will be first calculated as "the square of the distance between the two points" prior to calculating "the square root of the square of distance between the two points" for obtaining the distance between the two points. Consequently, it would have been obvious to a person of ordinary skill in the art to utilize **the squares of distance** in lieu of the **true distance** to recognize a target pattern because it will minimize recognition steps and computation time based on the fact if "A" = "B", then obviously "A<sup>2</sup>" = "B<sup>2</sup>", particularly, in instances where the values "A<sup>2</sup>" and "B<sup>2</sup>" are systematically being calculated prior to calculation of "A" and "B".

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-3, 9-13, 15-20, 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tisdale (U.S. 3,784,644).

Regarding Claim 1, Tisdale discloses a method of identifying a target pattern in an image, said method comprising:

a) establishing an inventory of characteristic pattern points within said target pattern and establishing a first record of relative distances between selected characteristic pattern points, said relative distances being recorded as the square of actual distances between said selected characteristic pattern points (Figures 1 and 2; Column 2, Lines 49-67, Column 3, Lines 1-8. Based on the fundamentals of mathematics, calculation of distance between two points (Length of a line connecting two points) includes summing the square of the difference between respective X coordinates of the two points (i.e.,  $(x_1-x_2)^2$ ) and the square of the difference between respective Y coordinates of the two points (i.e.,  $(y_1-y_2)^2$ ). The sum of  $(x_1-x_2)^2$  and  $(y_1-y_2)^2$  is being inherently recorded as the square of the distance between the two points prior to obtaining the square root of this value to calculate the distance between the two points.);

b) partitioning said image into a plurality of sub-image points (Figures 1 and 2, Image A, Points 1 and 2; Image B, Points 30 and 31);

c) identifying at least two sub-image points having attributes substantially similar to a corresponding two of said characteristic pattern points (Figures 1 and 2, Image A, Points 1 and 2; Image B, Points 30 and 31; Column 3, Lines 9-24);

d) calculating the square of the distance between said identified two sub-image points without determining the true distances between said identified sub-image points (Figures 1-3; Column 2, Lines 49-67, Column 3, Lines 1-8. Considering points **1** ( $X_{A1}$ ,  $Y_{A1}$ ) and **2** ( $X_{A2}$ ,  $Y_{A2}$ ), inherently, the sum of  $(X_{A1} - X_{A2})^2$  and  $(Y_{A1} - Y_{A2})^2$  will be first calculated as “the square of the distance between the two points” prior to calculating “the square root of the square of distance between the two points” for obtaining the distance between the two points.), and comparing said calculated distance to the recorded relative distance of said corresponding two characteristic pattern points (Figures 1-3; Column 3, Lines 35-67, Column 4, Lines 1-38);

e) determining that said target pattern has not been identified in response to no match being found in step (d) (Figures 1-3; Column 3, Lines 35-67, Column 4, Lines 1-38).

Tisdale do not specifically disclose avoiding the calculation of the square root of the square of the distance between said identified two sub-image points to utilize the square of the distance for comparison.

It would have been obvious to a person of ordinary skill in the art to modify Tisdale's invention to utilize the squares of distance in lieu of the true distance to recognize a target pattern because it will minimize recognition procedure and

computation time based on the fact if  $A = B$ , then obviously  $A^2 = B^2$ , particularly, in instances where the values  $A^2$  and  $B^2$  are systematically being calculated prior to calculation of  $A$  and  $B$ . This will avoid the calculation of the square root of the square of the distance between said identified two sub-image points in subsequent comparisons.

Regarding Claim 2, Tisdale further discloses the method of Claim 1, wherein said sub-image points are distinguished by corresponding X,Y coordinates of a Cartesian plane (Figures 1 and 2; Column 2, Lines 55-67). Based on the fundamentals of mathematics, calculation of distance includes summing the square of the difference between respective X coordinates of the two identified sub-image points and the square of the difference between respective Y coordinates of said two identified sub-image points.

Regarding Claim 3, Tisdale further discloses the method of Claim 1, wherein selected characteristic pattern points whose relative distances constituting said first record have an associated identification indicator identifying them as a recorded two-point set (Figures 1 and 2), said identified sub-image points being given the identification indicator of their correspondingly matched characteristic pattern points (Figures 1-3; Column 2, Lines 55-67; Column 3, Lines 1-8), and the square of the distance between said identified sub-points being calculated in step (d) only when their given identification indicator indicates that their corresponding characteristic pattern points are part of the same two-point set (Figures 1-3; Column 3, Lines 35-67, Column 4, Lines 1-38).

Regarding Claim 9, Tisdale further discloses the method of Claim 1 wherein each sub-image point is defined as a plurality of picture elements of said image (Figures 1 and 2; Column 2, Lines 55-67).

Regarding Claim 10, Tisdale further discloses the method of Claim 9 further including combining the image information of said plurality of picture elements in each sub-image point into a representative composite, and comparing said composite to said characteristic pattern points (Figures 1 and 2; Column 2, Lines 55-67).

With regards to Claim 11, arguments analogous to those presented for Claims 1, 4 and 6 are applicable to Claim 11.

With regards to Claim 12, arguments analogous to those presented for Claim 5 are applicable to Claim 12.

With regards to Claim 13, arguments analogous to those presented for Claim 6 are applicable to Claim 13.

Claims 15-18 comparisons are based on the standard conventional theorems for similarity of triangles such as matching "angle-side-angle", "side-angle-side", "three sides" and three angles" which are well known mathematical relationships.

With regards to Claim 19, arguments analogous to those presented for Claim 2 are applicable to Claim 19.

Claims 20, 26 and 27 recite the system for implementing the methodology Claims 11-13 and 15-19. Accordingly, arguments analogous to those presented for Claims 11-13 and 15-19 are applicable to Claims 20, 26 and 27.

5. Claims 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tisdale (U.S. 3,784,644) in view of Ehrat (U.S. 4,131,879).

Regarding Claim 4, Tisdale discloses grouping characteristic pattern points into two-point sets and an orientation angle, but do not specifically disclose further limitations recited in Claim 4.

Ehrat discloses a method and apparatus for determining the relative positions of corresponding points of a sample and an original comprising:

grouping characteristic pattern points into three-point sets defining a first angle having a characteristic pattern point at a vertex and two characteristic pattern points at side-ends of said first angle, the square of the distance between said vertex and each of the side-ends being part of said first record (Figure 10, Points 1, 2 and 27, and angle  $\psi$ );

establishing a second record of first angle parameters proportional to a corresponding first angle within said three-point sets (Figure 10; Column 11, Lines 10-23);

assigning an identification indicator to all three characteristic pattern points in each three-point set specifying which characteristic pattern point is at the vertex position and which are at either of the side-end positions of said first angle (Figure 10; Column 10, Lines 7-67, Column 11, Lines 1-33);

each first angle parameter being defined as the product of its corresponding first angle's side-lengths multiplied by the cosine of its corresponding first angle (The first angle parameter is inherently defined as " $bc \cos \alpha$ " based on the standard formula for the relationship between the sides and angles of a triangle, i.e.,  $a^2 = b^2 + c^2 - 2bc \cos \alpha$ , wherein  $\alpha$  is the angle between sides b and c.).

It would have been obvious to a person of ordinary skill in the art to modify Tisdale's invention according to the teachings of Ehrat to implement further limitations



recited in Claim 4 because it will increase accuracy and reliability of the pattern recognition system. By selecting a plurality of points errors will be minimized and computation times will be expedited (Ehrat, Column 2, Lines 21-42).

Regarding Claim 5, Ehrat further discloses the method of Claim 4 wherein said identified sub-image points are given the identification indicator of their correspondingly matched characteristic pattern point, and step (d) is implemented only when said identified sub-image points correspond to a complete three-point set (Figure 10; Column 10, Lines 7-67, Column 11, Lines 1-33).

Regarding Claim 6, Lin further discloses the method of Claim 4 wherein said identified sub-image points are given the identification indicator of their correspondingly matched characteristic pattern points, and further including:

f) calculating a second angle parameter of a second angle defined by three identified sub-image points corresponding to a complete three-point set of characteristic pattern points, the vertex of said second angle being the sub-image point whose identification indicator corresponds to the characteristic pattern point that is the vertex of said first angle; and comparing said second angle parameter with said first angle parameter of said corresponding three-point set (Figures 10-14; Column 10, Lines 7-67, Column 11, Lines 1-33).

Regarding Claim 7, Ehrat further discloses the method of Claim 6, further including:

g) determining that said pattern has been identified in response to said second angle parameter matching said first angle parameter and the square of the distance of the side-ends of said second angle matching the square of the distance of the side-ends

of said first angle (Figure 10. Based on the standard formula for the relationship between the sides and angles of a triangle, i.e.,  $a^2 = b^2 + c^2 - 2bc \cos \alpha$ , wherein  $\alpha$  is the angle between sides b and c, the square of the distance of the side-ends of the angles and angle  $\alpha$  are the conventional parameters used in evaluating the similarity or congruence of triangles.).

***Allowable Subject Matter***

6. Claims 8, 14 and 21-25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 8 of the instant invention recites the method of Claim 6, wherein said sub-image points forming the side-ends of said second angle are defined by X,Y coordinates of a Cartesian plane having positional value relative to the sub-image point identified as the vertex of said second angle; said second angle parameter being defined as the sum of the product of the X coordinates and the product of the Y coordinates of said sub-image points at the side-ends of said second angle.

Claims 14 and 21 recite analogous limitations as Claim 8, and are therefore allowable.

Claims 22-25 depend on Claim 21, and are therefore allowable.

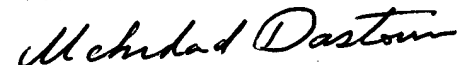
***Contact Information***

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mehrdad Dastouri whose telephone number is (703) 305-2438. The examiner can normally be reached on Monday to Friday from 8:00 a.m. to 4:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MEHRDAD DASTOURI  
PRIMARY EXAMINER



Mehrdad Dastouri  
Primary Examiner  
Group Art Unit 2623  
July 19, 2004